CEREBRAL PALSY: A CASE STUDY

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Abstract

The potential of variations of problems within a given individuals who may be diagnosed as having Cerebral Palsy has created difficulty historically for members of all professions that have dealt with the population . Indeed, the variety of etiologies that may result in Cerebral Palsy and the heterogeneity of disorders and disabilities that may be associated with the condition has led to serious question that the term Cerebral Palsy has clinical significance. A prime basis for success in dealing with diseases and/or disorders of humans has been the ability to identify their common elements. Whenever a homogeneous disease or disorder is identified and methods of treatment and prevention are found to be effective, the particular disease or disorder may then become subject to better understanding and, in most instances, to improved control, cure, or management. That is the prime purpose of diagnosed labels. Yet, over a century of study of the concept of cerebral palsy has shown that the label does not apply to a group with a homogeneous etiology or a common cluster of resulting disorders.

A number of definitions of cerebral palsy have attempted to encompass the heterogeneous characteristics of the individuals to whom the label has been applied. There is, however, far more general agreement about the common element of cerebral palsy among the clinical practitioners who become involved with those to whom the label is applied than is suggested by the numerous definitions in the literature. To those practitioners, the diagnosis of cerebral palsy means that the person has some form of dysfunction of the neuro-motor systems that has resulted from a non-progressive brain abnormality for which the onset was before, at, or shortly after the time of birth. That is also the most consistent connotation of the term throughout the historical and contemporary literature.

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1. INTRODUCTION

1.1 WHAT IS CEREBRAL PALSY?

In 1957, driven by the need to clarify the terminology used in different parts of the world, but also aiming at raising consensus about the classification, of CP, and the American Academy for Cerebral Palsy (AACP) conference was held. A definition, which is still very popular today, resulted from the conference, according to which CP must be considered as, "A permanent but not unchangeable disorder of posture and motion, due to a cerebral defect or non-progressive lesion, which took place before the brain had completed the main morphofunctional maturation processes; the motor disorder is prevalent but not exclusive, and may vary in type and severity".

With the same objective, in England, Ronnie Mac Keith and coworkers created the "Little Club" (Mac Keith et al. 1959), which, after many meetings, in 1964 published, edited by Martin Bax, a definition of CP which still has the widest international consensus, according to which, "Cerebral palsy is a posture and motion disorder, due to a defect or a lesion of the immature brain. For practical aims, we need to exclude from cerebral palsy those disorders of posture and motion which are 1) short-term, 2) due to a progressive disease, 3) exclusively due to mental retardation".

Some authors also tried to rewrite and update this definition, with few substantial Changes, such as Mutch et al (1992), who defined CP as, "An umbrella term covering a number of syndromes with motor deficiency, non progressive, but often changing, secondary to brain lesions or anomalies appearing in the early stages of brain development".

An international multidisciplinary team met in Bethesda (MD, USA) in July 2004. A revised definition was then produced by the Executive Committee of the team and published in 2006 (Rosenbaun et al. 2007) "Cerebral palsy (CP) describes a group of disorders of the development of movement and posture, causing activity limitations that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and/or behavior, and/or by a seizure disorder". (Rosenbaum et al. 2007). In this definition non-motor signs (perceptual, cognitive, epileptic) are now mentioned, but still as "accompanying" signs. Moreover, in line with the ICF approach, the importance of the assessment of activity limitation is acknowledged; people without activity limitation should not be included in the

definition of CP. An example of a novel approach to the definition and the classification of CP are

offered by the model suggested for quite some time by Adriano Ferrari (Ferrari, 1990), largely covered by this text, which lays its foundations in considering CP not as an alteration of muscle tone or as a set of pathological motor patterns but as a problem of functional organization of the child in his interaction with the surrounding environment. The organization mode is related not only with the motor disorder but also with the cognitive, perceptive and motivation problems, which are interrelated to a certain extent. In this perspective, to prevent it from being fragmented and scattered, as well as to offer prognostic and rehabilitation elements, the classification must necessarily take into consideration all the mentioned aspects.

Cerebral Palsy (CP) is a mental disorder which causes physical disability in Human development. CP affects the brain and Nervous system. Cerebral refers to the area in the brain that is affected (cerebral is the biggest part of our brain which controls all the activities of our day- to- day life), and palsy refers to muscle paralysis.

CP is caused by abnormal development or damage in one or more parts of the brain that control muscle tone and motor activity (movement). The resulting impairments first appear in the early phase of life, usually in infancy or early childhood.

Infants with cerebral palsy are usually slow to achieve developmental targets such as rolling over, sitting, crawling, and walking. Many individuals with cerebral palsy have normal or above average intelligence. Their ability to express their intelligence may be limited by difficulties in communicating.

All children with CP, regardless of intelligence level, are able to improve their abilities substantially with appropriate interventions. Most children with CP require significant medical and physical care, including physical, occupational, and speech /swallowing therapy.

Despite advances in medical care, cerebral palsy remains a significant health problem. The number of cases of cerebral palsy has increased over time. This may be because more and more premature infants are surviving**. In the United States, about 2-3 children per 1000 have cerebral palsy. As many as 1,000,000 people of all ages are affected.** Cerebral palsy manipulates both sexes and all ethnic and socioeconomic groups.

Difficulty in controlling and coordinating muscles is the common disorder to all individuals affected with cerebral palsy. This disorder caused by CP makes even very simple movements difficult. The effects of CP on individuals are given below:

i. Cerebral palsy may involve muscle stiffness (spasticity), poor muscle tone, uncontrolled movements, and problems with posture, balance, coordination, walking, swallowing, and many other functions.

ii. Mental Retardation, seizures, breathing, bladder and bowel control problems, skeletal deformities, eating difficulties, dental problems, digestive problems, and hearing and vision problems are often linked to cerebral palsy.

iii. People affected with CP experience hearing loss and/or language problems as well. Typically, such hearing loss is sensorineural (involving the nerves that enable sense perception).

iv. Some people with cerebral palsy experience some degree of speech and learning difficulties. The greater the brain damage, the greater the risk of cognitive problems. But it is important to note that CP can affect the entire body without harming intelligence.

The severity of these problems varies widely, from very mild and subtle to very profound.

1.2 TYPES OF CEREBRAL PALSY

1 SPASTIC (PYRAMIDAL): Increased muscle tone is the defining characteristic of this type. The muscles are stiff (spastic), and movements are jerky or awkward. The sub-types of Spastic Cerebral Palsy are:

a. Spastic Hemiplegia: A child with spastic Hemiplegia will typically have spasticity (muscle stiffness) on one side of the body - usually just a hand and arm, but may also involve a leg. The side that is affected may not develop properly. The child may have speech problems. In the majority of cases intelligence is not affected. Some children will have seizures.

b. Spastic Diplegia: The lower limbs are affected, and there is no or little upper body spasticity. The child's leg and hip muscles are tight. Legs cross at the knees, making walking more difficult. The crossing of the legs when the child is upright is often referred to as scissoring.

c. Spastic Quadriplegia: The child's legs, arms, and body are affected. This is the severest from of spastic cerebral palsy. Children with this kind of cerebral palsy are more likely to have mental retardation. Walking and talking will be difficult. Some children have seizures.

d. Spastic Monoplegia CP: Only one limb is affected, usually arm.

e. Spastic Triplegia CP: Three limbs are involved, usually both arms and a leg.

2 DYSKINETIC (EXTRA PYRAMIDAL): This includes types that affect coordination of movements. The sub types of Dyskinetic Cerebral Palsy are:

a. Athetoid: This is the second most common type of cerebral palsy. The person has uncontrolled movements that are slow and writhing. The movements can affect any part of the body, including the face, mouth, and tongue. About 10-20% of cerebral palsy cases are of this type. Some children drool if they have problems controlling facial muscles.

b. Ataxic: This type affects balance and coordination. Depth perception is usually affected. If the person can walk, the gait is probably unsteady. He or she has difficulty with movements that are quick or require a great deal of control, such as writing. About 5-10% of cases of cerebral palsy are of this type. There may be intention tremors - a shaking that starts with a voluntary movement, such as reaching out for a toy, the closer he/she gets to the toy the worse the tremors become. Most children with ataxic cerebral palsy are of normal intelligence and have good communication skills. Some may have erratic speech.

3 MIXED: It is a mixture of different types of cerebral palsy. A common combination is spastic and athetoid.

1.3 CAUSES

Cerebral palsy results from damage to certain parts of the developing brain:

1. This damage can occur early in pregnancy when the brain is just starting to form, during the birth process as the child passes through the birth canal, or after birth in the first few years of life.
2. In many cases, the exact cause of the brain damage is never known. At one time, problems during birth, usually inadequate oxygen, were blamed for cerebral palsy.
3. We now know that fewer than 10% of cases of cerebral palsy begin during birth (perinatal).
4. In fact, current thinking is that at least 70-80% of cases of cerebral palsy begin before birth (prenatal).
5. Some cases begin after birth (postnatal).
6. In all likelihood, many cases of cerebral palsy are a result of a combination of prenatal, perinatal, and postnatal factors.

1.4 SIGN AND SYMPTOMS

The signs of cerebral palsy are usually not noticeable in early infancy but become more obvious as the child's nervous system matures. Early signs include the following:

1. Delayed milestones such as controlling head, rolling over, reaching with one hand, sitting without support, crawling, or walking.
2. Persistence of "infantile" or "primitive" reflexes, which normally disappear 3-6 months after birth.
3. Developing handedness before age 18 months: this indicates weakness or abnormal muscle tone on one side, which may be an early sign of CP.

1.5 PROBLEMS

Problems and disabilities related to CP range from very mild to very severe. Their severity is related to the severity of the brain damage. They may be very subtle, noticeable only to medical professionals, or may be obvious to the parents and other caregivers.

1. Abnormal Muscle Tone: Muscles may be very stiff (spastic) or unusually relaxed and "floppy." Limbs may be held in unusual or awkward positions. For example, spastic leg muscles may cause legs to cross in a scissor-like position.
2. Abnormal Movements: Movements may be unusually jerky or abrupt, or slow and writhing. They may appear uncontrolled or without purpose.
3. Skeletal Deformities: People who have cerebral palsy on only one side may have shortened limbs on the affected side. If not corrected by surgery or a device, this can lead to tilting of the pelvic bones and scoliosis (curvature of the spine).
4. Joint Contractures: People with spastic cerebral palsy may develop severe stiffening of the joints because of unequal pressures on the joints exerted by muscles of differing tone or strength.
5. Mental Retardation: Some, although not all, children with cerebral palsy are affected by mental retardation. Generally, the more severe the retardation, the more severe the disability overall.
6. Seizures: About one third of people with cerebral palsy have seizures. Seizures may appear early in life or years after the brain damage that causes cerebral palsy. The physical signs of a seizure may be partly masked by the abnormal movements of a person with cerebral palsy.
7. Speech Problems: Speech is partly controlled by movements of muscles of the tongue, mouth, and throat. Some individuals with cerebral palsy are unable to control these muscles and thus cannot speak normally.

8. Swallowing Problems: Swallowing is a very complex function that requires precise interaction of many groups of muscles. People with cerebral palsy who are unable to control these muscles will have problems sucking, eating, drinking, and controlling their saliva. They may drool. An even greater risk is aspiration, the inhalation into the lungs of food or fluids from the mouth or nose. This can cause infection or even suffocation.
9. Hearing Loss: Partial hearing loss is not unusual in people with cerebral palsy. The child may not respond to sounds or may have delayed speech.
10. Vision Problems: Three quarters of people with cerebral palsy have strabismus, which is the turning in or out of one eye. This is due to weakness of the muscles that control eye movement. These people are often nearsighted. If not corrected, strabismus can lead to more severe vision problems over time.
11. Dental Problems: People with cerebral palsy tend to have more cavities than usual. This results from both defects in tooth enamel and difficulties brushing the teeth.
12. Bowel and/or Bladder Control Problems: These are caused by lack of muscle control.

2. METHODOLOGY

These methodologies are used in this research:

2.1 SELECTION OF THE INFORMANT

1. Hindi speaking children suffering with CP IS selected for this Dissertation.
2. Children suffering with CP aging five to ten are selected.
3. For confirmation that the child is suffering only with CP and not with other neurological disorders, expert is consulted.
4. The uniformity in the socio-economic conditions of the informant is middle class.

2.2 DATA COLLECTION

1. Preparation of word list supported with picture diagram using E-prime software.
2. Only Simple word (maximum tri-syllabic).
3. The focus is on sounds and aspiration.
4. These sounds are placed at word initial, medial, and final position of the word.
5. For validation of word list speech pathologist/linguist having experience in related area is consulted.
6. The efficiency of the word list is checked by conducting of pilot study.

2.3 PRESENTATION OF THE DATA

1. The collected data are transcribed using IPA.
2. The transcription is phonetic.
3. Software of acoustic phonetics is used to produce spectrogram.
4. Transcribed data is presented in a table format.
5. Statistical analysis is used to check the average of speech production accuracy.
6. On the basis of statistical analysis generalization is made which will lead to the result of the research.

3. SUBJECT

C1 is a 6 year old female child who is the first and only child to her parents. All her four limbs are affected with spasticity, with the lower limbs more affected than the upper ones. She is mobile and moves around on her legs although very clumsily so. She is observant and cognizant of the surroundings. She is a naughty and intelligent girl with a streak of stubborn nature in her. C1's parents are well educated (father is graduate and mother post-graduate) and belong to middle class in terms of socio-economic status. Mother was also working, but she quit the job to take care of the child. She takes very active interest in child and keeps herself informed as regard the general diagnosis and therapy procedures of CP. The parents live in a joint family set up and work well with the child.

3.1. PROBLEMS

The child's problem was present from birth but was identified around 2 years of her age. The affliction was diagnosed as spastic quadriplegia of the moderate degree by the pediatric neurologist.

C1 uses speech and gestures for communication. She speaks a lot but the sound more like jargon. She tries a lot to communicate but it is not well understood by the people around. This perhaps makes her fall back frequently upon gestures. She is comfortable in sitting down position on a chair suitable for her height. The speech corpus for this dissertation was collected in this most comfortable position.

3.2. DATA AND DATA INTERPRETATION

C1 has a limited phonological system. This apart, she also exhibits severe inconsistencies in the use of appropriate sounds, especially consonant in comparison with normal spoken Hindi language. (For detail description, see Hindi: Yamuna Kachru; 2006).

Vowels: the following table gives the list of vowels found in C1 speech.

	Front	Central	Back
High	i:		u:
Lower High	I		U
Mid	E		O
Lower Mid			
Low		a a:	

Table 1: Hindi vowel chart as well as C1's vowel chart.

The table reveals that C1 produce all the vowels in normal spoken Hindi language. The use of these vowels, however, is extremely inconsistent. This aspect is dealt with later in this section.

C1 uses mostly two diphthongs au and ai. While the former is retained as a diphthong, the latter may be pronounced either as a diphthong or as a combination of a and the semi-vowel y.

Consonants: Mostly the CPs faces problems in occurring stops and nasal sounds. The normal spoken Hindi has the following stops and nasal consonant:

	Voiceless		voiced		nasals
	Un-aspirated	Aspirated	Un-aspirated	Aspirated	
Velar	K	Kh	g	Gh	N
Palatal	C	Ch	j	Jh	ñ
Retroflex	ṭ	ṭ h	ḍ	ḍ h	
Dental	T	Th	d	Dh	N
Labial	P	Ph	b	Bh	M

Table 2: Hindi consonant chart.

The stops and nasals of C1:

	Voiceless		voiced		Nasals
	Un-aspirated	Aspirated	Un-aspirated	Aspirated	
Velar	K		g		
Palatal					
Retroflex					
Dental	T		d		N
Labial	P		b		M

Table 3: C1's consonant chart.

As this table shows that the aspiration is loss in C1's consonant chart. The CP's feel problem in uttering the consonant clusters also. The table above reveals that C1 has only following sounds in his consonant system: The voiceless k, t, and p and voiced g, d, and b. The nasals include the dental n and labial m.

The following are the sounds absent in C1's repertoire:

1. All aspirated sounds.
2. Palatal stops c and j.
3. Retroflex stops ʈ and ɖ .
4. Velar, palatal and retroflex nasals N, ɲ , ɳ respectively.
5. Fricatives h and f.
6. Retroflex lateral l.
7. Trill r.

Sl No.	Position	Word (Hindi)	Transcription	Informant response	Transcription
1	Initial	नया	/□↔□ □̃	मया	/□↔□ □̃
	Medial	मानक	/□ □ □↔k̃	मामच	/□ □ □↔□ □̃
	Final	मारना	/□ □ □ □ □̃	मामा	/□ □ □ □̃
2	Initial	फल	/□ □↔□̃	पल	/□↔□̃
	Medial	सफल	/□↔□ □↔□̃	सपय	/□↔□↔□̃
	Final	सरफ	/□↔□↔□ □̃	सयप	/□↔□ □ □̃
3	Initial	बात	/□ □ □̃5	दात	/□5□ □̃5
	Medial	गबन	/□↔□↔□̃	गदम	/□↔□5↔□̃
	Final	गुलाब	/□ □ □ □ □̃	बुयाब	/□ □ □ □ □̃
4	Initial	रमन	/□↔□↔□̃	यमम	/□↔□↔□̃
	Medial	झरना	/□ □ □↔□ □ □̃	जयमा	/□ □↔□ □ □̃

	Final	झूमर	/□ □ □ □↔□̃	जुमय	/□ □ □ □↔□̃
5	Initial	चरखा	/□ □↔□ □ □ □̃	तयका	/□5↔□↔□ □̃
	Medial	मचला	/□↔□ □↔□ □̃	मतया	/□↔□5↔□ □̃
	Final	आँच	/□)□ □̃	आँत	/□)□5̃
6	Initial	टमाटर	/τ↔□ □τ↔□̃	कमाकय	/□↔□ □ □↔□̃
	Medial	मटका	/□↔τ↔□ □̃	मकका	/□↔□↔□ □̃
	Final	घंटा	/□ □↔□τ□̃	गनका	/□↔□↔□ □̃

Table 4: Informant's response.

As included in the table above, C1has confusion in occurring dental nasal. She uses labial nasals for dental nasals. For ex: at initial positions मया for नया, at medial position मामच for मानक, at final position मायमा for मारना.

C1 has aspiration loss, un-aspirated voiced labial b for aspirated voiced bh. For ex: at initial position पल for फल, at medial position सपय for सफल, at final position सयप for सरफ.

C1 uses un-aspirated voiced dental d for un-aspirated voiced labial b. for ex: at initial position दात for बात, at medial position बदन for गबन, at final position बुयाब for गुलाब.

C1 uses voiced apico-palatal y for voiced alveolar r. For ex: at initial position यमम for रमन, at medial position जयमा for झरना, at final position जुमय for झूमर.

C1 uses un-aspirated voiceless dental t for voiceless un-aspirated palatal c. For ex: तयकाfor चरखा,at medial positionमतयाfor मचला, at final positionआतforआच.

C1 uses un-aspirated voiceless velar k for un-aspirated voiceless retroflex ट . For ex: at initial position कमाकय forटमाटर, at medial position मककाformटका, at final position गनकाforघंटा.

4. CONCLUSION

With proper therapy, many people with cerebral palsy can lead near-normal lives. Even those with very severe disabilities can improve their condition significantly, although they will never be able to live independently.

Approximately 25% of children with cerebral palsy have mild involvement with few or no limitations in walking, self-care, and other activities. Approximately half are moderately impaired to the extent that complete independence is unlikely but function is satisfactory. Only 25% are so severely disabled that they require extensive care and are unable to walk.

Of the 75% of children with cerebral palsy who are eventually able to walk, many rely on assistive equipment. The ability to sit unsupported may be a good predictor of whether a child will walk. Many children who can sit unsupported by age 2 years eventually will be able to walk, while those who cannot sit unsupported by age 4 years probably will not walk. These children will use wheelchairs to move around.

The likelihood of medical complications of cerebral palsy is related to the severity of the condition. Generally, the more severe the CP, the more likely are related conditions such as seizures and mental retardation. Individuals with quadriplegia are much more likely than those with Diplegia or Hemiplegia to have these related conditions.

- Seizure disorders occur in about one third of people with cerebral palsy.
- Mental retardation occurs in about 30-50% of people with cerebral palsy. Standardized tests that evaluate primarily verbal skills may underestimate a child's intelligence level.
- Obesity is a common problem in children who are confined to a wheelchair or are unable to move freely.
- Life expectancy in people with cerebral palsy also related to the severity of their condition. People with milder forms of cerebral palsy have the same life expectancy as the general population. Those with severe forms of cerebral palsy typically have a shorter life span, especially if they have much medical complication.

Some studies have found that abnormalities of muscle tone or movement in the first several weeks or months after birth may gradually improve over the first years of life. In one study, almost 50% of very young infants thought to have cerebral palsy and 66% of those thought to have spastic Diplegia "outgrew" these signs of cerebral palsy by age 7 years. Many children do not manifest full motor signs that are suggestive of cerebral palsy until aged 1-2 years. Thus, some propose that the diagnosis of cerebral palsy should be deferred until the child is aged 2 years.

For summing up, we can say that it can be possible to improve to some extent a child affected with CP. They have a lot of problems in their speech as I said earlier the children mostly affected with Spastic Quadriplegia have speech problems.

As I included in my data that they can't utter aspirated sounds, Consonant cluster while they utter diphthongs very clearly. So, at conclusion, I found the majority of absent sounds are aspirated sounds, retroflex and consonant cluster mostly.

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